

# SHER-E-BANGLA AGRICULTURAL UNIVERSITY



## AN ASSIGNMENT ON WHEAT VARIETIES

**COURSE TITLE :**

**AGRO 501 : ADVANCE CROP PRODUCTION TECHNOLOGY**

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## **ABSTRACT**

An assignment on Wheat varieties related to Course of AGRO 501 : Advance Crop Production Technology. Wheat is world's most commonly consumed cereal grains. Around 50% world cereal production is covered by wheat. China, India, Russia, USA, Canada are top wheat producing country. Variety is an important factor for better yield of crop. It is 3<sup>rd</sup> important cereal crop in Bangladesh. In Bangladesh, Wheat Research Centre, BARI released almost 33 wheat varieties. These are some heat tolerant, Salinity tolerant, some late sowing, some are short duration varieties. Zinc riched (BARI gom 33) Wheat varieties also released by BARI. Among those varieties, BARI Gom 24 (Prodip) covered highest cultivated area (186026 ha) which shared 41.03% of total wheat cultivated area. BARI Gom 21 (Shatabdi), BARI Gom 26 and BARI Gom 23 (Bijoy) ranked 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> position according to the share of cultivated area covered. Newly developed variety like BARI Gom 25, BARI Gom 26, BARI Gom 27 and BARI Gom 28 were the most promising varieties which showed increasing adoption path among the expert. These varieties have very good potentiality due to having short duration, tolerance to terminal heat stress, tolerant to salinity and lodging attributes. Satisfying higher demand for wheat consumption and ensuring food security through providing alternative to rice.

## INTRODUCTION

Wheat comes from a type of grass (*Triticum*) that is grown in countless varieties worldwide. It was one of the first domesticated food crops and for 8000 years has been the basic staple food of the major civilizations of Europe, West Asia and North Africa.

Species *Triticum* classified into 3 groups viz., diploids, tetraploids, hexaploids with 7, 14 and 21 pairs of chromosomes respectively. Bread wheat or common wheat (*Triticum aestivum*), is the most common species. Several other closely related species include durum (*Triticum durum*), spelt (*Triticum spelta*), emmer (*Triticum dicoccon*), einkorn (*Triticum monococcum*) and Khorasan (*Triticum turanicum*) wheat.

More than 80% of wheat in Bangladesh is grown in rice-wheat rotation of which about 50% is planted late. Late planting causes a significant yield (max.52%) loss in every year. Wheat normally flowers in the long days. Short days increase the vegetative growth, whereas longer days hasten the formation of inflorescence. Cool and moist weather favour vegetative growth and warm and dry weather favour grain formation.

It can be grown in tropical, sub-tropical, temperate and cold tracts zone. Although the crop is most successful between the latitudes of 30° and 60°N and 27° and 40°S (Nuttonson, 1955), wheat can be grown beyond these limits, from within the Arctic Circle to higher elevations near the equator. Development research by the International Maize and Wheat Improvement Center (CIMMYT) during the past two decades (Saunders and Hettel, 1994) has shown that wheat production in much warmer areas is technologically feasible. In altitude, the crop is grown from sea level to more than 3000 masl, and it has been reported at 4570 masl in Tibet (Percival, 1921). The optimum growing temperature is about 25°C, with minimum and maximum growth temperatures of 3° to 4°C and 30° to 32°C, respectively (Briggle, 1980). Wheat is adapted to a broad range of moisture conditions from xerophytic to littoral. Although about three-fourths of the land area where wheat is grown receives an average of between 375 and 875 mm of annual precipitation, it can be grown in most locations where precipitation ranges from 250 to 750 mm (Leonard and Martin, 1963). Crop cannot withstand extended periods of soil moisture stress.

## LITERATURE REVIEW

Wheat is a major diet component because of the wheat plant's agronomic adaptability, ease of grain storage and ease of converting grain into flour for making edible, palatable, interesting and satisfying foods. Optimum seeding rate and suitable cultivars play a vital role in achieving potential yield of wheat (Sikander *et al.* 2009; Khan 1996). In Bangladesh, Wheat Research Centre (Presently Bangladesh Wheat and Maize Research Institute), BARI plays key role to research and release of variety of Wheat. There is no detail wheat varietal adoption level study in Bangladesh. A very recent study conducted by WRC (2014) revealed the adoption level information of wheat varieties in the Bangladesh.

Wheat breeding research started in Bangladesh after the liberation war. The 'Noori 70', 'Balaka' and 'Doel' were first varieties developed by the scientists of BARI with the support of CIMMYT. The variety Noori 70 was developed in the year 1976 and 'Balaka' and 'Doel' were developed in the year 1980. In the initial stages of wheat growing in Bangladesh, several Mexican varieties, especially 'Sonora 64' and 'Kalyansona', were successfully introduced in collaboration with the International Maize and Wheat Improvement Center (CIMMYT). However, the release of 'Sonalika' created a true breakthrough in wheat production in the year 1972. This fast maturing and high-yielding variety (yield 2 t/ha) became very popular among wheat growers and adapted well to different production environments and was adopted in 80% of the wheat area by the early 1980s (WRC, 2009). In 1983, the Wheat Research Centre (WRC) of Bangladesh Agricultural Research Institute (BARI), released four more high-yielding (yield 2-3 t/ha) varieties (Ananda, Kanchan, Barkat and Akbar). Among these, 'Kanchan' proved particularly adaptable and gradually replaced 'Sonalika' to become the predominant variety in Bangladesh by the early 1990s. Two other high-yielding varieties, 'Aghrani' and 'Protiva', were recommended by the Bangladesh National Seed Board in 1987 and 1993, respectively. These varieties were more responsive to wider range of weather conditions as well as crop management practices such as fertilizers, irrigation and intercultural operations. Therefore, by the mid-1990s, adoption of high-yielding varieties were almost 100%, thereby increasing

wheat productivity substantially. However, breeding efforts to develop high-yielding varieties still continued. Several more high-yielding varieties were developed. These included ‘BARI Gom 19’ (‘Sourav’) and ‘BARI Gom 20’ (‘Gourab’) released in 1998; ‘BARI Gom 21’ (‘Shatabdi’) in 2000; ‘BARI Gom 22’ (‘Sufi’), ‘BARI Gom 23’ (‘Bijoy’) and ‘BARI Gom 24’ (‘Prodip’) in 2005 (Pandit *et al.*, 2011); and ‘BARI Gom 25’ and ‘BARI Gom 26’ released in 2010 (BARI, 2012). In 2012, two varieties, ‘BARI Gom 27’ and ‘BARI Gom 28’, were released and also in 2014, another more varieties, ‘BARI Gom 29’ and ‘BARI Gom 30’. ‘BARI Gom 31’, ‘BARI Gom 32’, ‘BARI Gom 33’ were released in the year of 2017.

## **MATERIALS AND METHOD**

The study was undertaken to find out different type of Wheat variety in Bangladesh. Information are collected from various sources. In this study, World top wheat growing countries data are collected from different website. For India, Russia, USA, Canada’s varieties, the data collected from wheatatlas that are conducted by CIMMYT.

For study of wheat varieties, different information are collected from different book, site and journal. This study heavily collected for varietal development information from Wheat Research Centre (WRC), of Bangladesh Agricultural Research Institute. The collected varietal information were sourced from different annual research report of WRC and BARI, Handbook of BARI developed crop varieties and technologies. For detail of these variety, most information are selected from ‘Handbook of Agricultural Technology’ which is published by BARC and ‘Krishi Projukti hatbio’ that is published by BARI. Some relevant information are collected from Digital herbarium of crop plants that are hosted by Department of Crop Botany, Bangabandhu Sheikh Mujibur Rahman Agricultural University. Nutritional and Statistical data are excerpt from Food and Agricultural Organization (FAO). Different information of these varieties like Salt tolerant, drought tolerant, Zn riched, Late variety are collected from BARI and BARC site. Wikipedia also plays a great role for this study.

## DISCUSSION

### Variety of major Wheat Producing Countries

**India** : HS-240, HS-365, VL-804, VL-832, HD2687, PDW-233(d), WH-147, WH-542, HI-8381(d), HI-8498(d), NP-200(di), HW-741, HW-2044 etc.

**Russia** : Omgau-90, Nota, Duet, Starshina, Batko, Czerniawa-13, Altaikaya 98 etc.

**USA** : Y Ingmar, SY Soren, Linkert, Barlow, SY Valda, Prosper, Faller, etc.

**Canada** : Red Fife, Ladoga, Hard Red Calcutta, Stanley, Preston, Bishop, etc.

### Varieties in Bangladesh

Wheat Research Centre (WRC), BARI has so far released 33 wheat varieties are given below;

BARI Gom 33, BARI Gom 32, BARI Gom 31, BARI Gom 29, BARI Gom 28, BARI Gom 27 (Francolin), BARI Gom 26 (Hashi), BARI Gom 25 (Tista), BARI Gom 24 (Prodip), BARI Gom 23 (Bijoy), BARI Gom 22 (Sufi), BARI Gom 21 (Satabdi), BARI Gom 20 (Gourob), BARI Gom 19 (Sourov), BARI Gom 18 (Prativa), BARI Gom 17 (Sawgat), Agrahani, Akbar, Ananda, Barkat, Khanchan, Pavan 76, Doel, Balaka, Nuri 70, Jupatico 73, Tanori 71, Sonalika, Norteno 67, Inia 66, Kalyansona, Sonora.

Characteristics	No	Variety
Heat Tolerant	5	BARI Gom 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33.
Saline Tolerant (8-10 mmol/cm)	1	BARI Gom 25
Bread	2	BARI Gom 22, 24
Late sown	3	BARI Gom 20, 23, 26, 28, 30, 31, 32.
Zinc riched (50-55 ppm) 3 times greater than rice		BARI Gom 33
Short duration (95-100 days)	3	BARI Gom 20, 22, 30, 32
Seed + green plant (4.5+11 t/ha)	2	BARI triticales 1, 2

Varieties attributes Farmers adopted wheat varieties due to some favorable varietal attributes. Different varieties have many type of different attributes. The experts of BARI explained the major reason behind adoption of any specific variety through identifying their main attributes. The major varietal attributes that attracted wheat farmers were mostly high yielder, bold and larger grain, short duration, tolerance to terminal heat stress and lodging. The early maturity, tolerant to salinity, and high yielding attributes of BARI Gom 25 were attracted by the farmers which led to a significant adoption level. BARI Gom 26 is well adopted due to its heat tolerant, short duration and disease resistant attributes. BARI Gom 27 and BARI Gom 28 are in increasing trend due to its special attributes like disease resistant to leaf and stem rust and also heat tolerant, and high yield. The salient features of newly released and popular wheat varieties are stated below-

#### ■ **BARI Gom 21 (Satabdi) (2000)**

It is a semi-dwarf with good tillering habit. Number of tiller /plant 4-6, leaf broad, recurved and light green, flag leaf are also broad, half erect and droopy, lip of lower glum of spikelet tall, approximately 8-10 mm and shoulder high, panicle initiation time 65-69 days, panicle long, grain white and large size, In ripening time panicle yellow but leaf sheath and lower panicle stand green.

- **Plant height :** 90-100 cm.
- **Crop duration :** 105 days.
- **Grains per spike :** 40-45.
- **Grain yield :** 3.6-5.0 t/ha.

#### ■ **BARI Gom 22 (Sufi) (2005)**

It is a semi-dwarf high yielding potential variety. Number of tiller/plant 4-5, leaf broad and deep green, panicle initiation time 58-62 days, spike long, grain white, glossy and small size. Resistance/tolerance Leaf rust preventive and leaf spot disease (blight) tolerant, temperature tolerant, as a result late planting yield are high unfilled grain can be overcome. Quality of the product Gluten in flour is strong with high elasticity and extensibility, thus suitable for bread making.



- **Plant height** : 90-102 cm.
- **Crop duration** : 100-110 days.
- **Grains per spike** : 50-55.
- **1000 grain weight** : 46-48 g.
- **Grain yield** : 3.6-4.8 t/ha.

#### ■ **BARI Gom 23 (Bijoy) (2005)**

It is a semi-dwarf high yield potential wheat variety. Leaves are broad, droopy and dark green in colour. It is an early maturing variety. The variety is tolerant to high temperature and gives 10-20% higher yield under late seeding. Flour is suitable for chapati making. The variety is tolerant to leaf blight and resistant to leaf rust diseases and moderately tolerant to terminal heat stress. Grains are white-amber and larger.

- **Grains per spike** : 3540.
- **1000 grain weight** : 47-52 g.
- **Grain yield** : 4.3-5.0 t/ha.
- **Duration** : 103-112 days.

#### ■ **BARI Gom 24 (Prodip) (2005)**

It is a semi-dwarf high yielding variety. The variety is tolerant to terminal heat stress and suitable for growing under both optimum and late sown conditions. This is a early maturing variety. Grains are white and amber. The flour is most suitable for bread making due to its strong gluten. It can be grown successfully throughout the country except in saline areas more than 6 mmhos.

- **Grains per spike** : 45-50.
- **1000 grain weight** : 48-55 g.
- **Grain yield** : 4.35.1 t/ha.
- **Duration** : 102-110 days.

### ■ BARI Gom 25 (2010)

The variety is semi-dwarf, early maturing and high yielding. It shows moderate level of tolerance to terminal heat stress giving 6-10% higher yield under late seeding. Leaves are deep green and broad. It takes 57-62 days to heading. Grains are amber in color and bright. The variety is highly tolerant to bipolaris leaf blight and resistant to leaf rust diseases. It can be grown under both optimum and late seeding conditions. The variety is moderately tolerant to salinity. Therefore, it can be grown in southern region having salinity level below 10 dS/m.

- **Plant height** : 95-100 cm.
- **Grains per spike** : 45-55.
- **1000-grain weight** : 54-58 g.
- **Grain yield** : 3.6-4.6 t/ha.
- **Duration** : 102-110 days.

### ■ BARI Gom 26 (2010)

The variety is semi-dwarf in height with high yield potential. It requires 60-63 days to heading. Grains are amber in colour and bright. The variety is tolerant to terminal heat stress giving 10-12% higher yield under late seeding. The variety is tolerant to bipolaris leaf blight and resistant to leaf rust diseases with moderate level of resistance to stem rust race (Ug99). The variety is suitable for growing both in optimum and late seeding condition. It can also be grown successfully throughout the country except in areas with salinity level less than 6 dS/m.

- **Plant height** : 92-96 cm.
- **Grains per spike** : 45-50.
- **1000-grain weight** : 48-52 g.
- **Grain yield** : 3.5-4.5 t/ha.
- **Duration** : 104-110 days.

### ■ BARI Gom 27 (2012)

This is a high yielding, short stature variety. It takes about 60-65 days for heading. Grains are white amber in colour and medium in size. It gives higher yield than other varieties although it is grown upto December 15-20. The variety is resistant to stem rust race (Ug99) and leaf rust and moderately resistant to bipolaris leaf blight.

- **Plant height** : 93-95 cm.
- **1000-grain weight** : 42-46 g.
- **Grains per spike** : 45-50.
- **Grain yield** : 3.5-5.4 t/ha.
- **Duration** : 105-110 days.

### ■ BARI Gom 28 (2012)

This is a high yielding, short stature and early maturing variety. It takes 60-65 days for heading. It is highly tolerant to terminal heat stress due to its earliness and grain yield 15-20% higher under late seeding. Grains are white, amber in colour and medium in size. The variety is resistant to leaf rust and moderately tolerant to bipolaris leaf blight. It also shows adult plant resistance (APR) to Ug99 race of stem rust. Due to its earliness and heat tolerance capacity it could fit well in the rice-wheat cropping system of Bangladesh. It could also be grown in southern part with salinity level up to 8.0 dS/m.

- **Plant height** : 95-100 cm.
- **Grains per spike** : 45-50.
- **1000-grain weight** : 35-40 g.
- **Grain yield** : 3.55.4 t/ha.
- **Duration** : 105-110 days.

### ■ BARI Gom 29 (2014)

Short duration. Number of tiller/plant 4-5, 55-60 days require for spike initiation, spike broad, grain white, bright and medium, tiller straight in seedling, plant deep green, very few hair present in upper node of culm. Flag leaf straight, glum of lower portion of spikelet shoulder medium broad and indented, lip tall(>12.1 mm) and spine has present in lip.

- **Plant height** : 95-100 cm.
- **Grains per spike** : 45-50.
- **1000-grain weight** : 44-48 g.
- **Grain yield** : 4-5 t/ha.
- **Duration** : 102-108 days.

### ■ BARI Gom 30 (2014)

Short duration. Number of tiller/plant 4-5, 55-60 days require for spike initiation, spike broad, grain white, bright and medium, tiller straight in seedling, plant deep green, very few hair present in upper node of culm. Flag leaf straight, glum of lower portion of spikelet shoulder medium broad and indented, lip tall (>12.1 mm) and spine has present in lip. Tolerant to leaf rust and leaf spot disease (blight). Heat tolerant.

- **Plant height** : 95-100 cm.
- **Grains per spike** : 45-50.
- **1000-grain weight** : 44-48 g.
- **Grain yield** : 4-5 t/ha.
- **Duration** : 102-108 days.

### ■ BARI Gom 31 (2017)

The variety is high yielding, early in maturity and tolerant to terminal heat stress. The variety is resistant to leaf rust and tolerant to BpLB disease. Grains are white amber in colour and medium in size. Leaves are broad and recurved. Glaucosity is weak in spike and culm and medium in flag leaf sheath. Few hairs present in upper culm node. Lower glume beak (LGB) length is small (<5 mm). LGB spicules- numerous, LGB shoulder medium in width and square.

- **Grains per spike** : 45-52.
- **1000-grain weight** : 46-52 g.
- **Grain yield** : 4.5-5.0 t/ha.

### ■ BARI Gom 32 (2017)

The variety is high yielding, early in maturity and tolerant to terminal heat stress. The variety is resistant to leaf rust and tolerant to BPLB disease. The variety also shows tolerance to wheat blast. Grains are white amber in colour and large in size. Leaves are broad and recurved. Glaucosity is medium in spike, culm and flag leaf sheath. Few hairs present in upper culm node. Lower glume beak (LGB) length is medium in length (7.0 mm). LGB spicules- numerous, LGB shoulder medium in width and elevated.

- **Grains per spike** : 42-47.
- **1000-grain weight** : 50-58 g.
- **Grain yield** : 4.6-5.0 t/ha.

### ■ BARI Gom 33 (2017)

Stem and leaf are dark green color, tillers are semi erect during heading. Flag leaf is wide and droopy. Glaucosity is weak in spike. Zn-enrich variety.

- **Grain yield** : 4.0-5.0 t/ha.

## CONCLUSION

The number of total variety released in the Bangladesh was 43 in the period 1965-2017 and highest number of variety released in the period 1996-2000. Very recently, the WRC of BARI developed and released 9 improved varieties from 2010 to till now. In development process of modern varieties WRC of NARS shared 85% of linkage and CGIAR shared 47.5% of linkage. Number of released variety linked with CGIAR was highest in the period 1971-1975 and NARS also had linkage in highest number of released variety on the same period. Although many high yielding promising varieties were developed through devoted effort of scientist of Bangladesh, but due to lack of proper planning and implementation the adoption rate of those varieties are very low and speed of adoption are slow. Effective planning to increase seed production and extension are the most important and demanding issue for increasing area adoption and production of high yielding wheat varieties thus consequently ensure food security through increase consumption and reduce import dependency on wheat.

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